Technology, information and learning

Ron Burnett
Emily Carr Institute of Art and Design, Vancouver, British Columbia, Canada

The context for learning, education and the arts has altered dramatically over the last few years, as has the cultural environment for educators and those involved in artistic and creative activities. A number of crucial developments have transformed the *terrain* of technology, education, art and culture, and these will have a profound effect not only on the social and political structure of advanced industrial societies, but on the ways in which we see ourselves, act upon and within the communities of which we are a part and how we create meanings, messages and information for the proliferating networks that now surround us.

This is not to say that we are undergoing a revolutionary change. I tend to see history as evolutionary, which in no way precludes dramatic shifts from occurring. As learners and educators, I believe it is our responsibility to become active within this environment and to develop the critical and creative tools to respond to the "ongoing evolution of an emerging aesthetic of interactivity in which aesthetic goals are linked with ethical goals and are based on a perspective of caring for both the individual and the larger economic, political, ecological, social and spiritual circumstances that create contexts for the individual" (Gigliotti 1998, p. 89).

Our cultural claims about the various factors that produce change tend to be linear — the line being one that moves along a fairly straight, if not narrow, trajectory from the less complex to the more complex. The approach that I will take looks at the displacements that are created by the movement from one phase to another — movement here being more like transportation framed by what Bruno Latour has described as "connections, short circuits, translations, associations, and mediations that we encounter, daily" (Latour 1997, p.183).

The continuing importance of mediation in digital media environments

Lou Gerstner, the Head of IBM, described Deep Blue, the computer developed to play chess at the grandmaster level, in these terms:

> *Deep Blue is emblematic of a whole class of emerging computer systems that combine ultrafast processing with analytical software. Today we're applying these systems to challenges far more vital than chess. They are used for example in simulation — replacing physical things with digital things, re-creating reality inside powerful computer systems* (Gerstner 1998, p. 2).

What is important here is not only the reference to Deep Blue and very fast computer systems, but the assumption that the replacement of physical things with digital things re-creates reality *inside computer systems* and, by extension, in reality itself. This may well be true and may well be happening, but we need to examine the implications of the claim and locate it within a cultural, social and economic analysis. And we need to become quite clear about the meaning of the term simulation, which is used most often to refer to an artificial environment that either replaces the real or, in Jean Baudrillard's words, become the real (Baudrillard 1988). Simulation, as I use it, means the creation of artifacts within computerised contexts, and their use and integration, as well as co-option, into an increasingly digital culture.

Historically, the advent of new technologies in the 20th century has been paralleled by claims of social effect and cultural transformation. These are synoptically represented by the continued influence of Marshall McLuhan on present thinking about technology and its effects. Many of the assumptions guiding McLuhan's cultural appropriation - by a variety of educators, writers, commentators and economists - do not stand up to rigorous scrutiny. It is important to understand, however, how crucial McLuhan has been in articulating the foundations for late 20th century claims about globalisation, and how these assumptions have been naturalised into economic and political policy making.

McLuhan's famous statement that "The Medium is the Message" grew out of a report that he wrote in 1959-60 for the Office of Education, United States Department of Health, Education and Welfare. It was entitled "Report on Project in Understanding New Media." In this report, McLuhan analyses media such as television using cognitive psychology, management theory and economics. For McLuhan, media include speech, writing, photography, radio, etc. And he is puzzled by why the effects of these media have been overlooked for, "...3500 years of the Western world" (McLuhan 1960, p. 1). When it comes to the famous aphorism about the medium and the message, McLuhan reveals a rather interesting foundation for much of his later research.

> *Nothing could be more unrealistic than to suppose that the programming for such media could affect their power to re-pattern the sense-ratios of our beings. It is*

> *the ratio among our senses which is violently disturbed by media technology. And any upset in our sense-ratios alters the matrix of thought and concept and value. In what follows, I hope to show how this ratio is altered by various media and why, therefore, the medium is the message or the sum-total of effects. The so-called content of any medium is another medium.* (McLuhan 1960, p. 9)

It is clear from this statement that the medium is actually the subject. It is human beings whose sense-ratios are altered by participating in the experiences made possible through the media. It is not the content of the communication, but the encounter between the medium and subjectivity that alters or disturbs how we then reflexively analyse our experience. Although 'the medium is the message' is generally interpreted in formal terms, and has been appropriated as a generalisation used to explain the presence of media in every aspect of our lives, McLuhan is here playing with cognitive and psychological research as it was developed in the 1950's. More importantly, at this stage, he is avoiding a binary approach to form/content relations. He is effectively introducing a third element into the discussion, namely, embodied human subjectivity.

This initial creativity was soon lost in the final version of *Understanding Media*, published in 1964, where the medium becomes the message through the operations of an instantaneous sensory recognition of meaning. McLuhan explores affect by claiming that cubism in its elimination of point of view, generated an "instant total awareness [and in so doing] announced that the medium is the message" (McLuhan 1994, p.13). I am not sure what 'instant total awareness' is, but one can surmise that it is somewhere between recognition and self-reflexive thought. In choosing this rather haphazard approach, McLuhan eliminates all of the mediators that make any form of communication work.

It is this elimination of mediation that led him to assume an equivalence between the creation of networks of information through technological innovation and their impact. In other words, messages recreate the people who respond to and use them. Information alters the parameters of our relationship to the world. Yet how could this be proven? To varying degrees, depending on culture and background among other factors, human beings create and communicate messages from birth onwards. Cultures are built on knowledge and the way knowledge is structured and presented. The many questions that we have to ask about how technology intervenes in this process cannot be answered if the a priori assumption is that the impact is somehow greater than other forms and methods of communication.

Few users of the World Wide Web, to take one example, are aware of the various hubs that move data around at high speed, nor the complexity of the servers that route that data into their home or business computers. They become aware of the mediators when there is a breakdown, or when the system gums up. The notion that we receive information instantly is tied up with the elimination of mediation. So, the arrival in my home of a television image from another part of the world seems instant, but is largely the result of a process in which radically different versions of time and space have played significant roles (the motion and position of the satellite, transmitting stations, microwave towers and so on). The notion of instant recognition has played a significant role in the ways in which our culture has understood digital communications. This has tended to reduce if not eliminate the many different facets of the creative and technological process that makes it possible for the communicative process to take place. Crucially, as mediation recedes into the background the claims for impact and effect grow stronger.

The subject as the message, not the medium

But let's return to the more interesting and potentially creative idea McLuhan hinted at, that the subject is the message. As the sense-ratios alter, the sum-total of effects engenders a subject surrounded by and encapsulated within an electronic world, a subject who effectively becomes that world, as in Baudrillard's notion of the simulacrum (Baudrillard 1988). This is not simply the movement from machine to human, it is the integration of machine and humans where neither becomes the victim of the other. As mediums we move meanings and messages around in a variety of creative ways, and as humans interacting with machines we are the medium within which this process circulates. Crucially, this does not mean that we have become the machine, a concept that has inspired a great deal of criticism of technology in general. Rather, we end up sharing a common ground with our own creations, a mediated environment which we are explore every day and as we try to make sense of the information that is being presented to us.

Derrick De Kerckhove, the Director of the McLuhan Program at the University of Toronto, who has been described as the successor to McLuhan himself, recently wrote a book entitled *The Skin of Culture: Investigating the New Electronic Reality*, where he argues:

> *With television and computers we have moved information processing from within our brains to screens in front of, rather than behind, our eyes. Video technologies relate not only to our brain, but to our whole nervous system and our senses, creating conditions for a new psychology.* (De Kerckhove 1995, p. 5).

To Kerckhove, human beings have become messages (and this is different from being mediums) with our brains emulating the processing logic and structural constraints of computers. Here we *do* become the

machine. We no longer signify as an act of will. Agency is merely a function of messaging systems. Agency no longer recognises its role as a medium and as a result we seek and are gratified by the instantaneous, the immediate, the unmediated.

The ramifications of this approach are broad, and need extensive thought and clarification. The important point here is that De Kerckhove has moulded the human body into an extension of the computer, because we are already, to some degree, machines. Our nervous systems, which scientists barely understand, and our senses, which for neuroscientists remain one of the wonders of nature, are suddenly characterised through the metaphors of screens, vision, technology and a new psychology. The inevitable result are mechanical metaphors that make it seem as if science, computer science and biotechnology will eventually solve the ambiguous conundrums of perception (e.g., in the virtual world we become what we see), knowledge and learning. To say that we are the machine is a far cry from understanding the hybrid processes that encourage machine-human interactions. De Kerckhove has transformed the terrain here much as McLuhan did, so that humans lose their autonomy and their ability to act upon the world. In this rather mechanical view of the human mind which is being used here, McLuhan's simplified versions of affect and effect continues to operate. The equations that are drawn among experience, images and technology in such an approach reduce the creative engagement of humans with culture and technology to the point where culture and technology become one, eliminating the possibility of contestation.

Hybrid interactions and the scope for contestation

Many of the complaints about digital technologies, such as fears of being overwhelmed if not replaced by such media, are the result of not recognising the potential to *recreate* (either by contestation or new ways of thinking) the products of technological innovation. The best example of such recreation is the way video games have evolved, from rudimentary forms of storytelling to complex narratives driven by the increasing ease with which the games are mastered by players. The sophistication of the players has transformed the technology. But none of this would have been possible without the ability of the technology to grow and change in response to the rather unpredictable choices made by humans. This highly mediated symbiosis suggests that human beings are continuously reinventing their relationship with technology and this is a site of learning for teachers and students and the public at large.

If we turn to the computer for a moment, the notion that it has the power to affect human cognition is rooted in debates and theories developed within the fields of cybernetics and artificial intelligence. The notion that a computer has memory has taken root in such a powerful way that it seems *impossible* to talk about computers without reference to memory. In a curious feedback loop, computer memory now becomes a standard which we use to judge memory in general, hence the fears about Deep Blue somehow replacing the human mind, even though its programming was created by humans! The problem is that there is a long tradition of human creativity in the development of technologies, and this history is embedded in every aspect of our daily lives. Deep Blue is just one more extension of the process. The fact that we can use the computer to judge our own memories certainly doesn't eliminate anything. It merely means that we now have a tool that we can use to examine what we actually mean by memory. In fact, recent neuroscientific research into memory suggests that we have profoundly underestimated our own minds, let alone the digital ones that we are creating.

It is important to understand that computer programs are carefully constructed artificial languages that have great difficulty dealing with the unpredictable, with the tentative, the contingent or the irrational. Computer programs are codified according to a strict set of rules, whereas common sense is not. So why explore the intersections of human thought and computer programming? My tentative answer would be that we have not understood the breadth and depth of the relationships that we develop with machines. Human culture is defined by its on-going struggle with tools and implements, continuously finding ways of improving both the functionality of technology and its potential integration into everyday life. Computer programming may well be one of the most sophisticated artificial languages which our culture has ever constructed, but this does not mean that we have lost control of the process.

The problem is that we don't recognise the symbiosis, the synergistic entanglement of subjectivity and machine. If we do, it is often through the lens of otherness, as if our culture is neither the progenitor nor really in control of its own inventions. There could be no greater simplification than the one which claims that we have become the machine, or machines are extensions of our bodies and our identities. The struggle to understand identity involves all aspects of experience and it is precisely the complexity of the struggle, its very unpredictability, which keeps us producing ever more complex technologies and keeps the questions *about* technology so much in the forefront of everyday life.

The desire to create the technology for artificial intelligence is rooted in generalised views of human intelligence. These generalisations typically downplay questions of cultural specificity, or of the impact of recognition of ethnicity, class or gender upon the underlying assumptions concerning technology. The assumption

that the creation of technology is not constrained by the boundaries of cultural difference is a major problem, since it proposes a neutral register for the user as well. I must stress that these problems are endemic to discussions of the history of technology.

Part of the reason is that machines are viewed not so much as mediators, but as tools — not as integral parts of human experience, but as artifacts whose status as objects enframes their potential use. Computers, though, play a role in their use. They are not simply instruments, because so much has been done to them in order to provide them with the power to act. What we more likely have here are hybrids, a term coined by Bruno Latour to describe the complexity of interaction and use that is generated by machine-human relationships.

Although computers are designed by humans, programmed by humans and then used by humans, this is only part of the story. The various dimensions of the experience are not reducible to singular instances, nor to the sum total of what they suggest about computer-human interaction. Instead, most of what makes up the interaction is not predictable, is full of potential errors of translation and action and is not governed by simple rules of behaviour. "Computational structures" cannot be designed in anticipation of everything that is done with them. This crucial point can be used to explain if not illustrate the rather supple nature of machine-human relations. It can also be used to explain the extraordinary number of variables which both make it possible to design a program, and not know what will be done with it.

Another example of this richness at work comes from the gaming community (which is different from the video game community). There are tens of thousands of people playing a variety of games over the Internet. Briefly, the games are designed with very specific parameters in mind. But what gamers are discovering is that people are grouping themselves together in clans to play the games in order to win. These clans are finding new ways of controlling the games and rewriting the rules to their own specifications, thereby alienating many of the players. In one instance, in response to one such sequence of events, a counter-group got together and tried to create some semblance of governance to control the direction in which the game was headed. After some months the governing council that had been formed grew more fascistic and set inordinately strict rules for everyone. The designer of the game quit in despair.

This example illustrates the gap, the necessary gap between the "representational data structure" (Smith 1996, p. 43) that initially set up the parameters of the game and the variables introduced by the participants. But it also points out the limitations of the design process, limitations that cannot necessarily be overcome by increasingly complex levels of design. This is, in other words, a problem of representation. How can code be written at a level that will be able to anticipate use? The answer is, for the most part, with great difficulty. It is our investment in the power of the computer that both enhances and changes the coding and the use we make of the computer. We have thus not become extensions of the machine but have acted in concert with it, much as we might with another human being.

This is hybridity, and it suggests that technology and the practical use to which we put technology always exceeds the intentional structures that we build into it. It is within and through this excess that we learn. It is because of this excess that we are able to negotiate a relationship with the technologies that make up our environment. And it is the wonder, the freshness, the unpredictability of the negotiation process that leads us to unanticipated results, such as, for example, Deep Blue actually beating Kasparov!

I have brought all of these issues into the foreground in order to enlarge upon the global debate about the usefulness of computers for education. If we are able to more fully understand the technology, then perhaps we will make better use of it. Equally, we can maintain a healthy scepticism about utopian claims for the impact of digital modes of communication, if we are willing to understand that the technological infrastructure now being put in place can be used to improve and enhance the learning and teaching process.

References

Baudrillard, Jean, 1988, "Simulacra and Simulations", in M. Poster (ed.), *Jean Baudrillard: Selected Writings*, Polity Press, Cambridge.

De Kerckhove, Derek, 1995, *The Skin of Culture: Investigating the New Electronic Reality*, Somerville House Books, Toronto.

Gerstner, Lou , 1998, "The Knowledge Net," *Think Leadership Magazine*, Vol. 3, No. 1.

Gigliotti, Carol, 1998 , "Bridge To, Bridge From: The Arts, Technology and Education," *Leonardo*, Vol. 31, No. 2.

Latour, Bruno, 1997, "Trains of Thought: Piaget, Formalism, and the Fifth Dimension," *Common Knowledge*, Vol. 6, No. 3.

McLuhan, Marshall, 1960, "Report on Project in Understanding New Media," Office of Education, United States Department of Health, Education and Welfare, June 30, 1960.

McLuhan, Marshall, 1994, *Understanding Media*, MIT Press, Cambridge, Massachusetts, (first published 1963).

Smith, Brian Cantwell, 1996, *On The Origin of Objects*, MIT Press, Cambridge, Massachusetts.